Introduction
Sea lice occur naturally in the marine environment. Adult sea lice live on the skin of fish and are known as ectoparasites. _Lepeoptheirus salmonis_ (Leps) and _Caligus elongatus_ infect salmonids in Scottish waters. Whilst Leps is a salmonid specialist, _Caligus elongatus_ has been reported to infect over 80 different fish species including salmonids. Leps remains one of the most important health issues for the Scottish salmon aquaculture industry.

What harm can sea lice cause?
Sea lice damage their hosts’ skin through feeding. This can result in secondary infections by viruses and bacteria. Infestation can cause stress and immune suppression with greater susceptibility to secondary infection and the onset of disease.

Treatments can result in a reduction of feeding in farmed fish, resulting in poorer weight gain. There is scientific evidence of links between aquaculture activity and lice levels on local wild sea trout populations.

Leps life cycle
The _Lepeoptheirus salmonis_ life cycle comprises ten stages from egg to adult and includes planktonic (Nauplius I and II) as well as infectious (Copepodid to adult) stages which require a salmonid host (see above). During its planktonic stages Leps can be dispersed long distances.

What methods are available for controlling sea lice?
Integrated sea lice management
Scotland’s marine Atlantic salmon (_Salmo salar_) farming sector uses an integrated approach to sea lice management that includes:
- Operating within industry defined farm management areas, where fish should be of a single year class, and with synchronised fallowing and treatment;
- Strategic control measures at key time periods;
- The application of medicinal control in a manner which would reduce emergence of parasite resistance; and
- The investigation and introduction of novel biological (use of wrasse) and non-biological control methods.

Medicinal control
Authorised medicines used to control sea lice in Scotland are administered either as a bath or in feed treatment. Bath treatments are applied using full...
enclosure, in a tarpaulin, at a marine cage site, or in a wellboat adjacent to the marine cages. The following treatments may be administered:

- **Paramove** (Trade name): active ingredient is hydrogen peroxide
- **Salmosan** (Trade name): active ingredient is azamethiphos;
- **AMX** (Trade name): active ingredient is deltamethrin
- **Excis** (Trade name): active ingredient is cypermethrin

The following products are administered in feed.

- **SLICE** (Trade name): active ingredient is emamectin benzoate
- **CALICIDE** (Trade name): active ingredient is teflubenzuron

**Biological control**

Wrasse species and lumpsuckers are natural predators of ectoparasites on fish and their use as a biological control for sea lice on farms is being actively investigated by the aquaculture industry. Wrasse breeding and production is being developed to provide a regular and sustainable supply for biological control.

**Further research and control methods**

- **Filter systems** - in well boats and processing plant effluent outlets to prevent dislodged lice from escaping back into the environment
- **Immunostimulants** - these products are added to the salmon diet to stimulate host immune response and reduce stress
- **Vaccines** - research is underway to develop an effective vaccine
- **Semiocchemicals** - these are natural products detected by sea lice which hide the ‘scent’ of the sea lice host or repel the sea lice
- **Dispersal models** - these predict sea lice dispersal patterns, dispersal distance and accumulation. If proven robust they could provide a useful tool to help identify effective sea lice management areas and different management strategies to optimise sea lice control.

**Regulation and best practice**

- The majority of the finfish farming industry in Scotland operates to a voluntary code (A Code of Good Practice for Scottish Finfish Aquaculture (CoGP)) that represents the standard against which farms are measured through independent auditing. Sea lice is specifically referred to in Annex 11 of the CoGP which details the National Strategy for Sea Lice Control. The strategy is based on current scientific knowledge and practices.

- Marine Scotland Fish Health Inspectorate (FHI) inspects sea lice records and assesses the measures in place to prevent, control and reduce parasites on farms under the Aquaculture and Fisheries (Scotland) Act 2007 and the Fish Farming Businesses (Record Keeping) (Scotland) Order 2008. Unsatisfactory control measures or records may result in a further enhanced inspection of the farm, issuing of advice and/or recommendations, or implementing enforcement action.

- The FHI undertakes veterinary medicines residues sampling under The Animal and Animal Products (Examination for Residues and Maximum Residue Limits) Regulations 1997 on behalf of the Veterinary Medicines Directorate – the competent UK authority for use of veterinary medicines.

- Marine Scotland Licensing and Operations Team (MS-LOT) regulates the discharge of sea louse medicines from wellboats under the Marine (Scotland) Act 2010. A licence must be held for each farming site where a wellboat is used and discharges must have prior authorisation.

- The Scottish Environment Protection Agency (SEPA) regulates the discharge of sea lice medicines from cages under the Water Environment (Controlled Activities) (Scotland) Regulations 2005.

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